

REMARKS

Claim 1 has been amended to provide that there is no free chloride or bromide present during the reaction. Support may be found at page 38/ln 19. Support for quenching with organic or organometallic materials is found at page 23/lns 16-32 and Table 10 at page 24. Claim 33 has been amended by inserting the structure for formula XVI at page 31/ln 2.

Claim 33 stands rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The claim defines arene hydrocarbon as XVI. The structure has been inserted in the claim.

Claims 1-3, 8, 9, 15, and 18 stand rejected under 35 U.S.C. 102(b) as being anticipated by Sartori et al. (J. Org. Chem. 1993, 58, 7271-7273).

According to the Examiner:

On page 7271, Scheme I, Sartori et al disclose a method of forming an aryl-aryl bond between two hydrocarbon molecules. The process is described on page 7272, column 2, 2nd paragraph of the experimental section. Sartori et al. use AlCl₃, DDQ, and HCl under room temperature in formation of aryl-aryl bond.

As the Examiner recites, Sartori employs a free halide in the form of HCl. Free halides are not allowed to be present in accordance with the amendment. Thus, the claims are not anticipated.

Claims 1, 4-6, 17 and 19 stand rejected under 35 U.S.C. 102(b) as being anticipated by Kovacic et al. (Chem. Rev. 1987, 87, 357-379). According to the Examiner:

On page 363, column 1, equation 4, Kovacic et al disclose aryl-aryl bond formation between two polycyclic hydrocarbon molecules. The process is carried out in the presence of a Lewis acid (FeCl₃) and an organic oxidant (PhNO₂).

Applicants have determined that the nitrobenzene of the reference does not function as an oxidant as required in the present claims, perhaps because another component is functioning as the oxidant. Page 363 of Kovacic refers to Journal article #144 in relation to equation 4. At the back of the Kovacic

Reference #144 is an article by Feasey et al., a copy of which is enclosed. At pages 244 Feasey describes the reaction that takes place in nitrobenzene solution. He does not identify the material as an oxidant in his system. In the mechanistic detail provided, there is not a reaction product from the reduction of nitrobenzene shown. It appears that iron is the reduced material. Presumably the iron is a more efficient oxidant than nitrobenzene in this system. In any event, the Kovacic reference does not anticipate the claimed invention.

Claims 1-3, 9-11, 15-18 and 26 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Sartori et al. (J. Org. Chem. 1993, 58, 7271-7273). Sartori's employing HCl provides no suggestion of the recognition of the negative effects of halides in the reaction. Accordingly, it does not render obvious the advantage of avoiding them in the presently claimed invention.

Claims 1, 2, 3, 7, 27, 28, 29 and 30 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Kovacic et al. (Chem. Rev. 1987, 87, 357-379) in view of Sep et al (Tetrahedron, 1979, 35, 2161-2168). As discussed above, Kovacic fails to show one of the listed organic oxidants in his reaction. CuCl_2 is his oxidant according to page 360, col. 1, middle of page. The Examiner also acknowledges that Kovacic does not show the Bronsted acid. The Examiner notes regarding the secondary reference, Sep:

Sep et al. have studied the formation of aromatic radical-cations. Sep et al teach that DDQ together with TFA push the equilibrium in the radical-cation formation process completely to the right (page 2161, column 2, last paragraph).

Even if the equilibrium is pushed all the way to the right when making such material, this fact is not related to the yield of a reaction conducted when using such material.. Sep does not teach what to do with radical cations. If the catalyst is not effective for a particular reaction, it will not matter that there is more of the material present. It is also noted at page 2167/col. 2 top of Sep that the stability of his cations is greatly decreased with increasing concentration of the oxidant (ca. DDQ) concentration. In SEP, his concentration is $1 \times 10^{-5}\text{M}$ whereas in the present examples, the concentration is $2 \times 10^{-1}\text{M}$, approximately 20,000 times greater. It would seem that using the Examiner's logic, the material of the present invention would be far less efficient in producing product.

According to the Introduction at page 357, col. 2, of Kovacic, the paper is directed to Friedel-Crafts catalysts which are AlCl_3 -based. Such materials would provide free halide and are thus outside the scope of the present invention. It does not appear that the discussion of how to make a reactant in Sep in combination with Kovacic whose teachings are limited to Friedel-Crafts AlCl_3 reactions would lead one of ordinary skill in the art to the invention claimed that is free of free halides.

It is further noted that there is no suggestion in the cited art of the use of an organic or organometallic quencher. Applicants do not agree that quenching is a routine experimental step. The yields can be unexpectedly altered through quenching and the Examiner is requested to provide support for his position.


It is additionally noted that Applicants have been unable to find the radical cation in Scheme IV as cited by the Examiner. There is no component with an unpaired spin.

Claim Objections

Claims 12-14, 20-25, 31 and 32 sand objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. In view of the foregoing amendments and remarks, these objection appear to be moot.

In view of the foregoing amendments and remarks, the Examiner is respectfully requested to withdraw the outstanding rejection and to pass the subject application to Allowance.

Respectfully submitted,



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If the Examiner is unable to reach the Applicant(s) Attorney at the telephone number provided, the Examiner is requested to communicate with Eastman Kodak Company Patent Operations at (585) 477-4656.